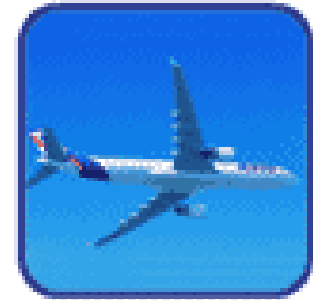




From Procedure



...Radar...



...to Trajectory

AFAS

Aircraft in the Future ATM System

A research programme part-funded by the EC DG Research 2000-2004

Pierre DEPAPE – Airbus

4th Integrated Communication, Navigation and
Surveillance Conference and Workshop

CO-ORDINATED BY

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April 26-30, 2004 FAIRFAX, Virginia



Main Work Areas and Objectives

➤ *Objective 1:*

- Define and propose an achievable ATM operational scenario for the core European airspace, that will yield a potential benefit in terms of capacity and safety increase

➤ *Objective 2*

- Define, develop, integrate and verify this avionics package supporting ATM functionality

➤ *Objective 3*

- Demonstrate the viability of concepts based on real-life 2005 scenarios

Introduction

Achievement

Conclusion

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Project Rationale

- Digital exchange of information between **airports**, **(airline) operation centers**, **flow management**, **pilots and controllers** AND between systems create the foundation towards:
 - an interoperable ATM network
 - seamless operations
 - Collaborative decision making operations
- Define a concept in way that current Flight Management System (FMS) and Aircraft trajectory are one of the key elements
- Use and capitalize as much as possible on existing architecture, system, wiring, data

➤ *(green) : not addressed in AFAS*

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AFAS Consortium



- Introduction
- Achievement
- Conclusion

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Achievements

Introduction

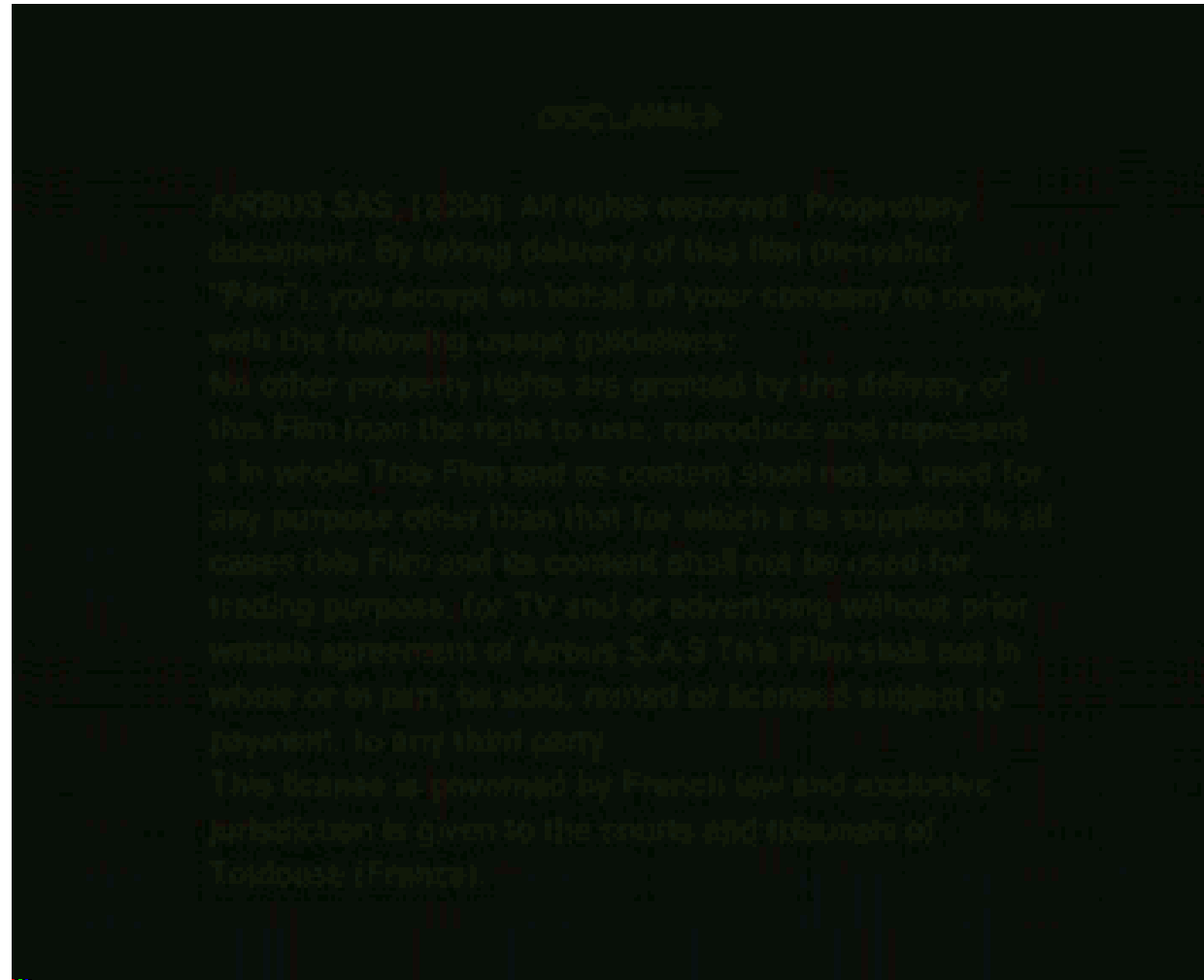
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➤ Setting the ATM standards *VIDEO*

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AFAS Operations Summary

➤ On ground:

- Trajectory agreement between aircraft and ATC based on:
 - ADS 4D trajectory transmission to ATC
 - ground constraints uplink by CPDLC (if needed)

➤ In flight:

- 4D Trajectory monitored on board and downlink in case of changes (active flight plan modified and ETA slippage)
- Exception handling (need of trajectory modification):
 - Air or ground modifications transmission by CPDLC
 - Agreed trajectory uplink by CPDLC
 - On board new 4D activated trajectory downlink via ADS

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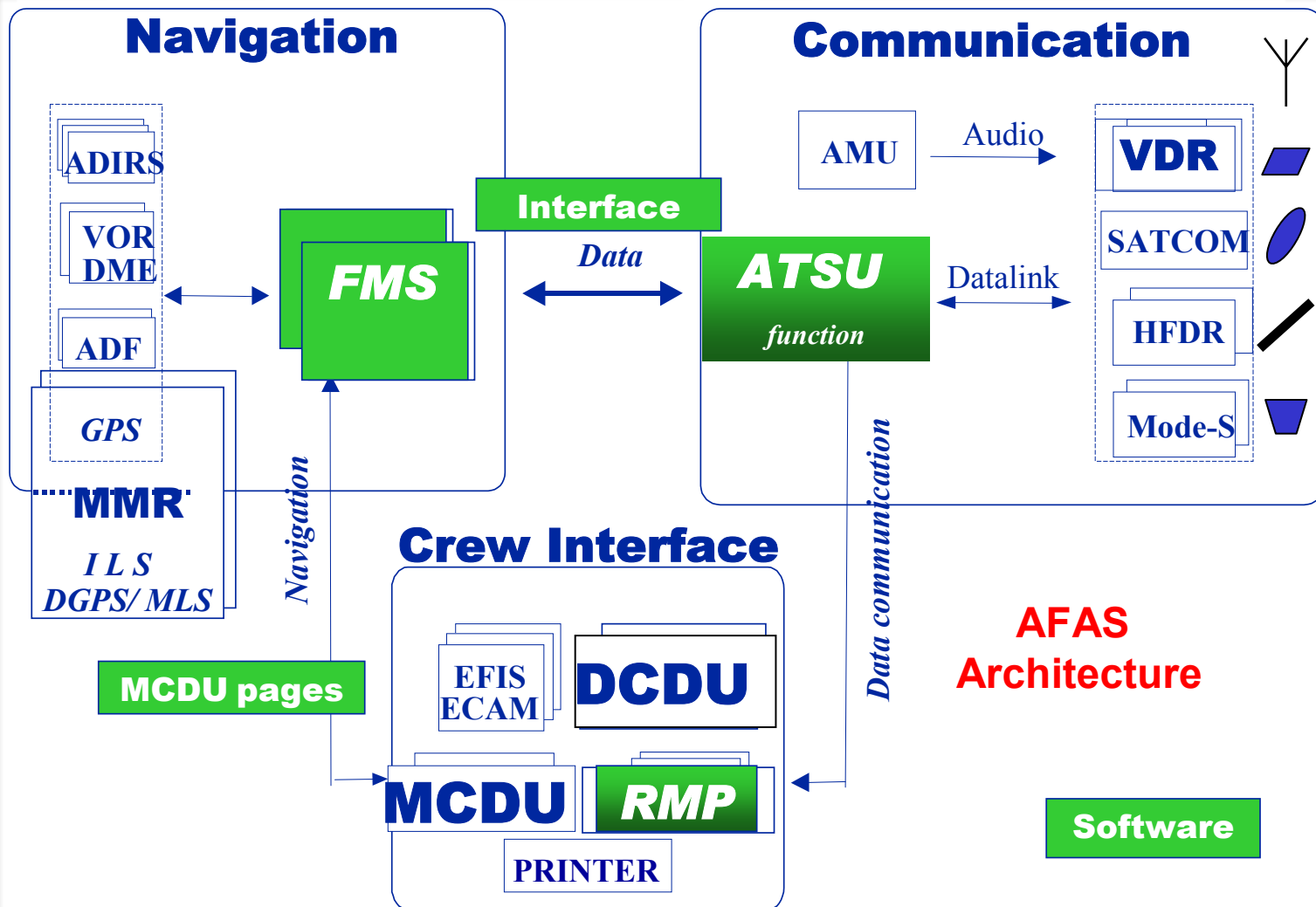
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Avionics Package



**AFAS
Architecture**

Software

No Impact on Current A320 architecture

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Operational Validation

Link 2000+ Validation

- Validation of Link 2000+ baseline (RTCA/EUROCAE – ED110) has been performed in collaboration with the French DGAC (STNA)
- Communication validated with the private ATN/ VDL2 private infrastructure of STNA
- Results are documented in the Operational Validation Test Report – some minor discrepancies have been detected but without any interoperability impacts for operation

Bonus: AFAS has contribute to the Standardisation of RTCA/EUROCAE Departure Clearance Definition (ED120/ED110)

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Operational Validation

Pre-flight phase

Goal & Rational:

- demonstrate that additional exchange of information between aircraft and ATC improve the departure sequence
- Adjust departure time within the CFMU slot

AFAS contribution

- Exchange (refinement) of departure / arrival constraints
- Dissemination of the 4D FMS flight plan

Results

- **Modeling assessment has shown**
 - a reduction of in-flight time,
 - Reduction of delay
 - The feasibility to prioritize a set of constrained aircraft
- **Operational simulation has confirmed the potential of new collaborative decision processes for the improvement of the departure sequence**

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Operational Validation

En-route / Arrival phases

Goal & Rational:

- demonstrate that 4D FMS exchange between aircraft and ATC improve capacity and contribute to on-time operation
- benefits to transfer some tactical tasks

AFAS contribution

- Transparent downlink of the 4D FMS flight plan
- 4D FMS flight plan negotiation

Results

- Modeling assessment has shown
 - An increase of capacity
 - Operational simulation has confirmed the potential of the 4D FMS trajectory as one of the key enabler for ATM improvements

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Conclusions

- Concept based on Flight Management System (FMS) and Aircraft trajectory is feasible.
- “small “ changes to the existing avionics and no added display wiring antennas units
- Work effectively and reliably
- Gave capacity and punctuality benefits
- The existing SARPS can support the improvements

Bonus: Additional safety benefits need to be evaluated.

- Introduction
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